UTAH DEPARTMENT OF TRANSPORTATION

TECHNICAL BULLETIN MT-03.05

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SPECIFICATION CHANGE NOTIFICATION

PROFILOGRAPH AND PAVEMENT SMOOTHNESS

FIGURE 1. CALIFORNIA PROFILOGRAPH

Smooth pavement is the number one public demand. Also, pavement with a smooth surface is proven to last longer. The California Type Profilograph, shown in Figure 1, is a primary tool used to measure the pavement smoothness in Utah. It consists of a rigid 25 ft. long frame, supported at each end by a wheel assembly with a measuring wheel at the center of the frame. It has a computerized recorder capable of graphing a trace of pavement profiles to a vertical scale of 1 to 1 ratio and horizontal scale of 1 to 300 ratio. Other capabilities of the recorder include data storing, data reduction and printing. **It is operated at a speed no greater than 3 miles per hour.**

A California Profilograph trace identifies the "must grind" high individual bumps and gives the roughness measurement in a Profile Index (PI or PRI).

Safety, longer lasting pavement, low maintenance, low life cycle cost, low cost on vehicle operation and maintenance are some of the benefits of the smoother pavement surface.

The advantages of using the California profilograph are its successful track record, the simplicity of operation and maintenance, technology, cost of the equipment. Most of the contractors in the state already owned a profilograph.

PROPER APPLICATION

The profilograph is used to obtain the surface smoothness of Hot Mix Asphalt (HMA), Open Graded Surface Course (OGSC) and Portland Cement Concrete Pavements (PCCP). In the case of a chip seal application, the surface smoothness is obtained on the HMA surface prior to application of the chip seal.

UDOT has a equipment calibration and operator certification program for profilograph. All profilographs used in UDOT projects are required to be calibrated and certified once every year. The profilograph operators are required to take training and operator qualification certification once every three years. Project personnel are advised to check for both certifications.

* SPECIFICATIONS/DETAILS

UDOT specification 01452 "Profilograph and Pavement Smoothness" addresses the smoothness of all pavement surfaces in one place. The major changes in the specification are:

- Profile Index requirement is fixed at 5 inch/mile for both PCCP and HMA Category 1, Class 1 surfaces and 7 inch /mile for Category 2, Class 1 surfaces.
- Pavement smoothness requirements are removed from other related HMA and PCCP specifications and refer to this specification.
- Disincentive is added for all pavement surfaces. (In earlier special provisions on smoothness, only incentives were addressed.)
- The unit of measurement for incentive was in $/square-yard area. The incentive and disincentive are now

computed in $/0.1lane-mile segment in the current specification.

- Contractors are required to perform QC tests and rectify all defects such as must grind and prepare for the acceptance testing.
- Acceptance tests will be run only once and the incentive/disincentive will be computed from the results. UDOT witnesses the acceptance tests.

The designer needs to include this specification in the project document in addition to other specifications.

COST INFORMATION

The Contractors in the State already own a California type profilograph. These profilographs are duly calibrated and certified. Contractors' operators are also duly trained and awarded operators qualification certificates.

As this specification is the part of the paving HMA and PCCP specification, there is no cost associated with it. Only cost associated with it will be the incentive/disincentive paid as a result superior pavement surface. **The maximum achievable bonus must be accounted for in project budget.**

The cost of a profilograph is about $35,000.00.

RELATED APPLICATIONS

In recent years there has been many developments in the pavement profile measuring devices. The profilometer and light-weight profilometer are examples of recent development. The profilometers measure profile in IRI, which is different from PI unit.
UDOT has Profilograph and Pavement Smoothness specification with a Zero Blanking Band as a special specification. This specification is being implemented in some projects for greater degree of smoothness and verification of incentive/disincentive schedule. UDOT will address these items in more detail in future bulletins.

FURTHER INFORMATION

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ASTM E 950 *Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Intertial Profiling Reference*
ASTM E 1274 *Standard Test Method for Measuring Pavement Roughness Using a Profilograph*
NCHRP 1-31 *Smoothness Specifications for Pavements*